WORKFORCE NEEDS FOR RENEWABLE ENERGY POWERPLANTS IN SOUTHERN CALIFORNIA

Center for Energy Efficiency & Renewable Technologies

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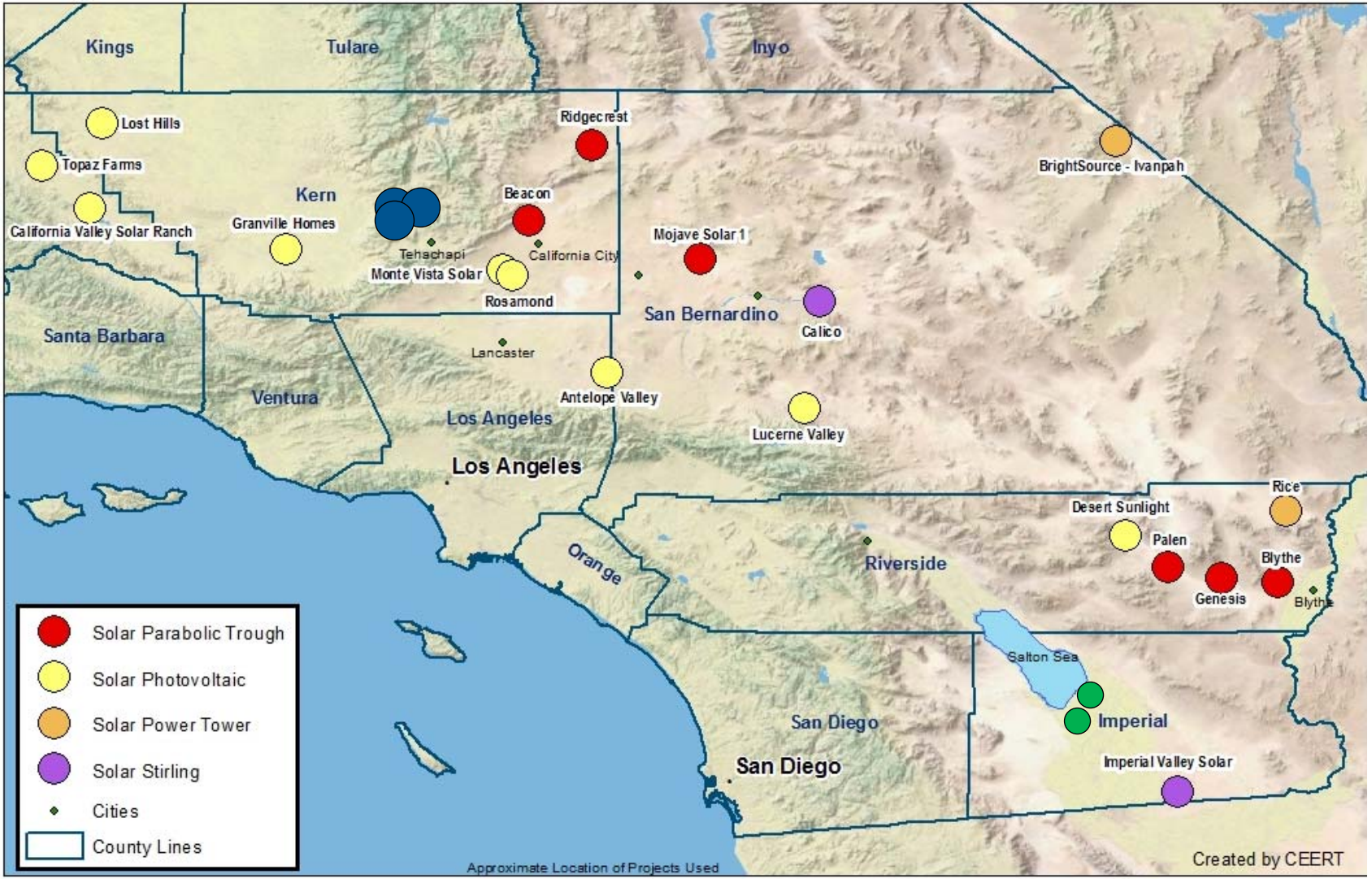
Southern California Survey Focus

The region is an excellent illustration of economic development coming from the clean energy sector.

- SoCal has the best combination of renewable "fuels" in North America.
- Next to large populations with huge electric demands.

Best in Class:
The world's most-experienced and innovative renewable energy companies are proposing to build dozens of clean powerplants in Southern California.



Geothermal

Wind

Key Renewable Projects 2010-2011

CEERT SURVEYED 14 CLEAN ENERGY DEVELOPERS IN SOCAL WE ASKED:

1. What Kind of Workforce is Needed to Build Your Project?
2. How Many People are Needed?
3. How Long Will It Take to Build the Project?
4. What Type of Workforce is Needed to Operate the Plant After It Is Built?
5. How Long Will the Powerplant Operate?


Photo: EngineerLive.com


Photo: Ashhurst Engineering & Construction

WHAT WE LEARNED ABOUT 14 CLEAN POWER PROJECTS:

The clean energy build-out requires a large workforce.

Thousands of workers are needed at the 14 sites in Southern California between 2010-2015 to build the powerplants.

Hundreds of Operations and Maintenance jobs are needed for the next 20-30 years.

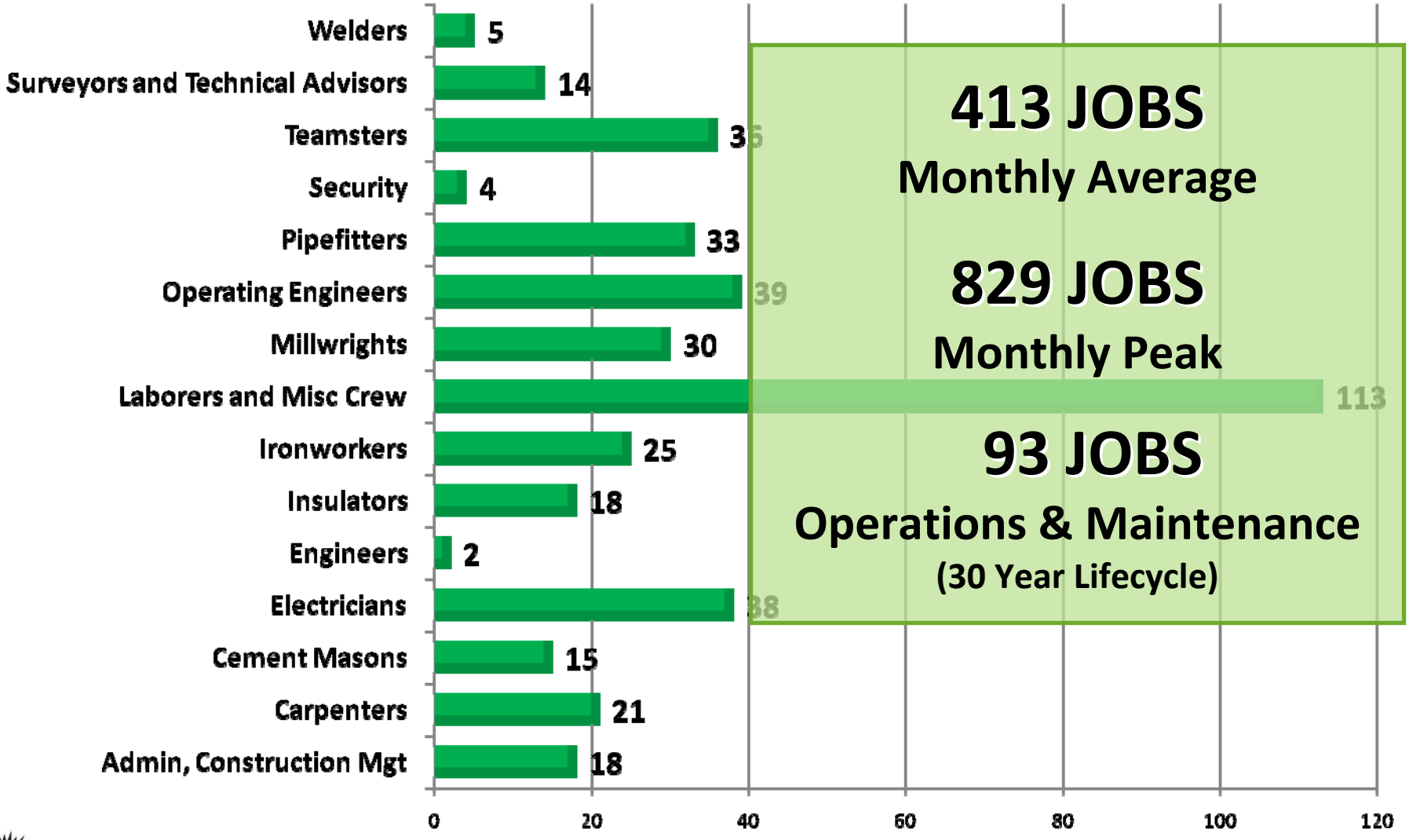
Skilled and general laborers, project managers, equipment operators, engineers and office personnel will run the plants.

GEOTHERMAL & WIND CONSTRUCTION WORKFORCE NEEDS

DEVELOPER	TECHNOLOGY	PROJECT NAME	MW SIZE	AVG # JOBS FTEs PER MONTH	EMPLOYMENT LENGTH
GEOTHERMAL					
CALENERGY	Geothermal	Black Rock 1-3	162	**323**	4 YEARS
RAM POWER	Geothermal	Orita 1	49	**90**	3 YEARS
WIND					
ENXCO	Wind	Pacific Wind	250	**318**	**3 YEARS**
HORIZON WIND	Wind	Homestead	100	**159**	**1 YEAR**
TERRAGEN	Wind	Alta Wind 1 Mohave	720	**250**	**1.5 YEARS**
TOTAL			**1,281 MW**	**1,140 JOBS/MONTH COMBINED**	**1-3 YEARS**

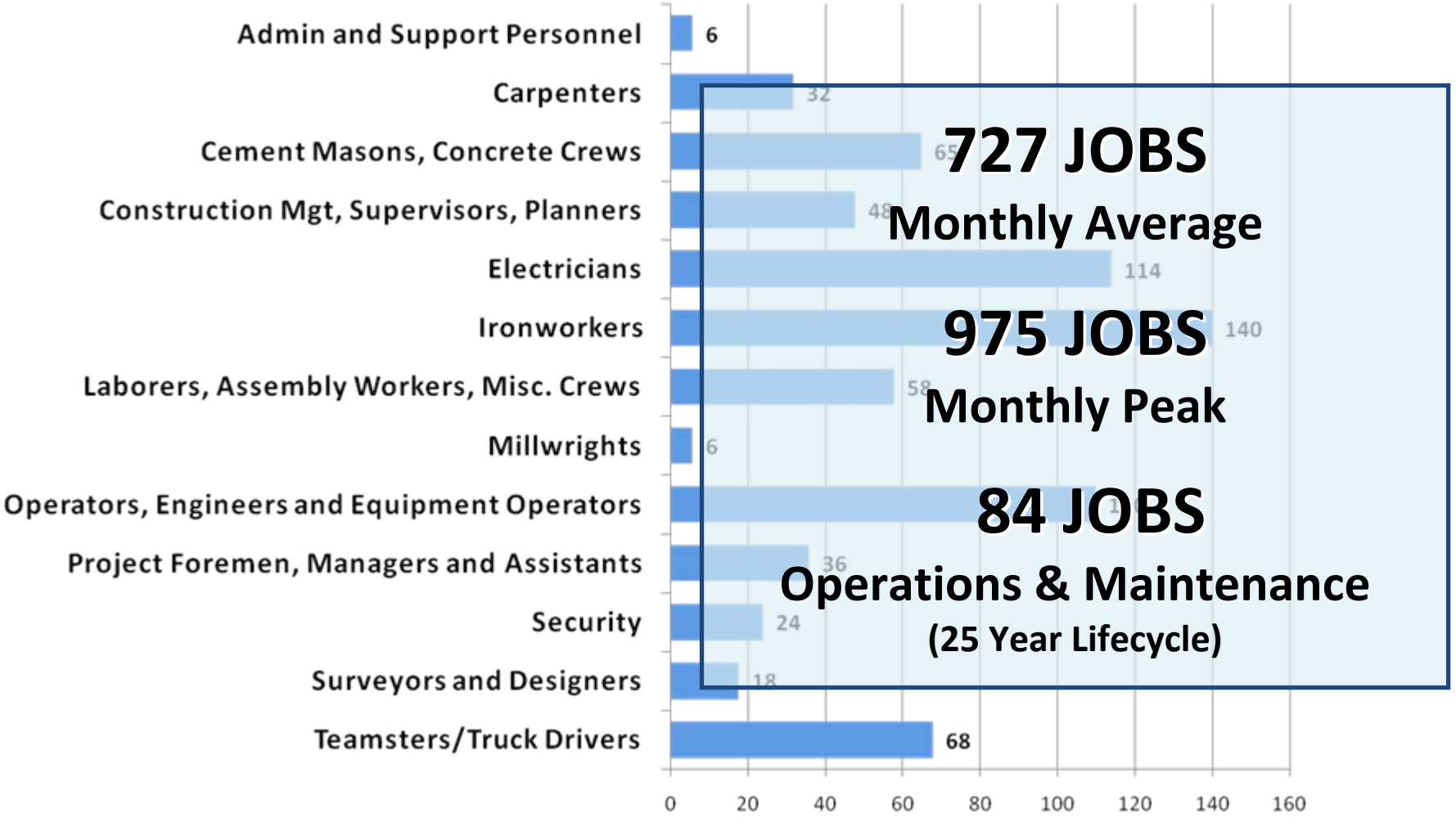
The survey is a sample, not a census, of all the projects being developed. Prepared by Center for Energy Efficiency & Renewable Technologies

Monthly Construction Jobs Estimates
2 Geothermal Projects: 211 MW
Length of Construction: 3 – 4 Years




PPTECHNIQ.COM

Monthly Construction Jobs Estimates
3 Wind Projects: 1,070 MW
Length of Construction: 1 – 3 Years



Over 7,700 MW of Solar Projects Prioritized in Southern California

LARGE-SCALE SOLAR CONSTRUCTION WORKFORCE NEEDS

DEVELOPER	TECHNOLOGY	PROJECT NAME	MW SIZE	AVG # JOBS FTEs PER MONTH	EMPLOYMENT LENGTH
ABENGOA	Parabolic Trough	Mojave Solar 1 Project	250	**830**	2 Years
SOLAR MILLENNIUM	Parabolic Trough	Blythe Solar Power Plant	1,000	**604**	~6 Years
SOLAR MILLENNIUM	Parabolic Trough	Palen Solar Power Plant	500	**566**	3.5 Years
SOLAR MILLENNIUM	Parabolic Trough	Ridgecrest Solar Power Plant	250	**405**	2.5 years
NEXTERA	Parabolic Trough	Beacon Solar Energy Project	250	**507**	3.5 years
NEXTERA	Parabolic Trough	Genesis Solar Energy Project	250	**507**	2.5 Years
TESSERA	Stirling Engine	Imperial Valley Solar	709	**360**	3.5 years
PERMACITY	Photovoltaics	Five 5 MW Systems	25	**500**	.5 year
SUNPOWER	Photovoltaics	California Valley Solar Ranch	250	**353**	~3 Years
TOTAL			**3,484 MW**	**4,632 JOBS/MONTH**	**~3 YEARS**

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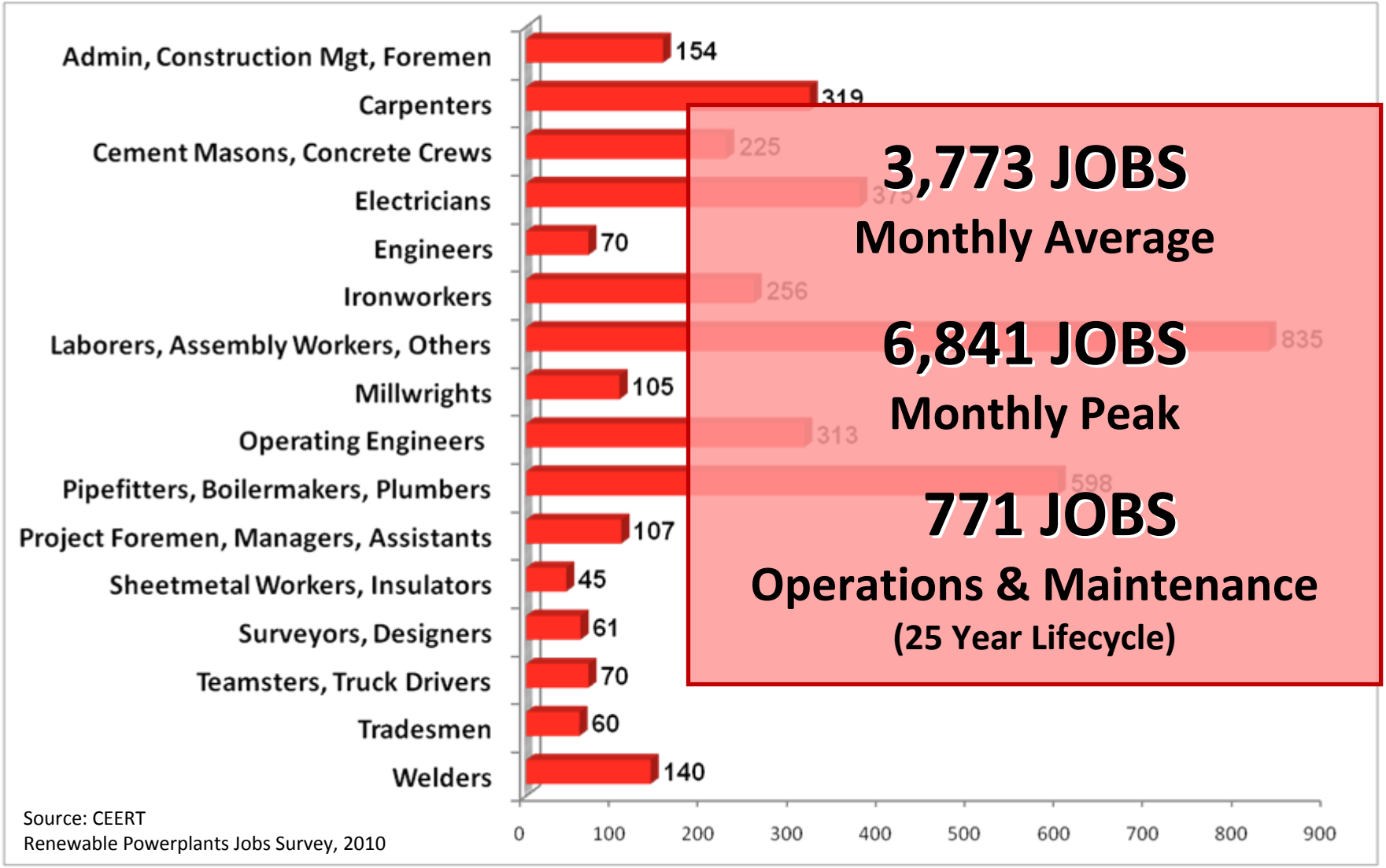
Monthly Construction Jobs Estimates
7 Solar Thermal Projects: ~3,500 MW
Length of Construction: 2.5 – 6 Years



Source: CEERT
Renewable Powerplants Jobs Survey, 2010

CONSTRUCTION WORKFORCE ESTIMATES
1,000 MW PARABOLIC TROUGH PLANT
Construction Period: ~6 Years

Job Description	AVERAGE Monthly Workforce (FTEs)	PEAK Monthly Workforce (FTEs)
Administrators and Support Personnel	11	14
Carpenters	57	90
Cement Masons and Concrete Crews	59	95
Construction Management, Supervisors, Planners	2	3
Electricians	58	81
Engineers	7	8
Ironworkers	24	50
Laborers, Assembly Workers, Misc. Crews	106	271
Millwrights	14	18
Operators	57	152
Pipefitters, Boilermakers, Plumbers	136	299
Project Foremen, Managers and Assistants	2	3
Surveyors and Designers	8	20
Teamsters, Truck Drivers	18	43
Other Skilled Tradesmen	12	66
Welders	1	1
Others (Oilers, Security, Sprinklerfitters, Tech Advisors)	5	10
TOTAL	**577**	**1004**

Source: SolarMillennium, CEERT Renewable Powerplants Jobs Survey, 2010

OPERATIONS & MAINTENANCE JOBS EARNINGS
250 MW SOLAR THERMAL POWERPLANT

Job Description	Annual Workforce	Salary (Average)
General: Office Personnel, Administration, Managers	10	$ 126,500
Engineering: Controls, Electrical, Mechanical, Plant and Resource Engineers, Project Analyst, Chemical Technician, Engineering Technician, Operations Supervisors	6	$ 117,500
Maintenance: Mechanical Technicians, Electricians, Equipment Operators, Welders, Machinists, Planners, Equipment Washing Technicians, Auto Mechanics	25	$ 87,800
Operations: Shift Supervisor, Control Operator, Plant Operator, etc.	22	$ 91,100
Unskilled Labor	5	$ 25,000
TOTAL	**68**	**$ 92,600**

Source: Abengoa, CEERT
Renewable Powerplants Jobs Survey, 2010

CONSTRUCTION WORKFORCE NEEDS
250 MW PHOTOVOLTAIC SYSTEM
Construction Period Length: ~3 Years

Job Description Average	AVERAGE Monthly Workforce (FTEs)	PEAK Monthly Workforce (FTEs)
Administrators	2	4
Carpenters	12	15
Cement Masons	10	20
Construction Staff	3	6
Electricians	25	50
Engineers	2	2
Laborers	10	20
Operating Engineers	7	15
Operators	5	10
Project and Construction Managers	7	10
Solar Field Craft: Incl's Apprentices, Assistants and Helpers	90	133
Surveyors	4	8
Teamsters	20	30
Welders	15	30
TOTAL	**212**	**353**

Source: CEERT Renewable Powerplants Jobs Survey, 2010

UNEMPLOYMENT RATES HIGH IN CLEAN ENERGY PROJECT COUNTIES

Imperial	**31.30%**
Kern	**14.40%**
Los Angeles	**12.50%**
Riverside	**15.30%**
San Bernardino	**14.80%**
San Luis Obispo	**9.70%**

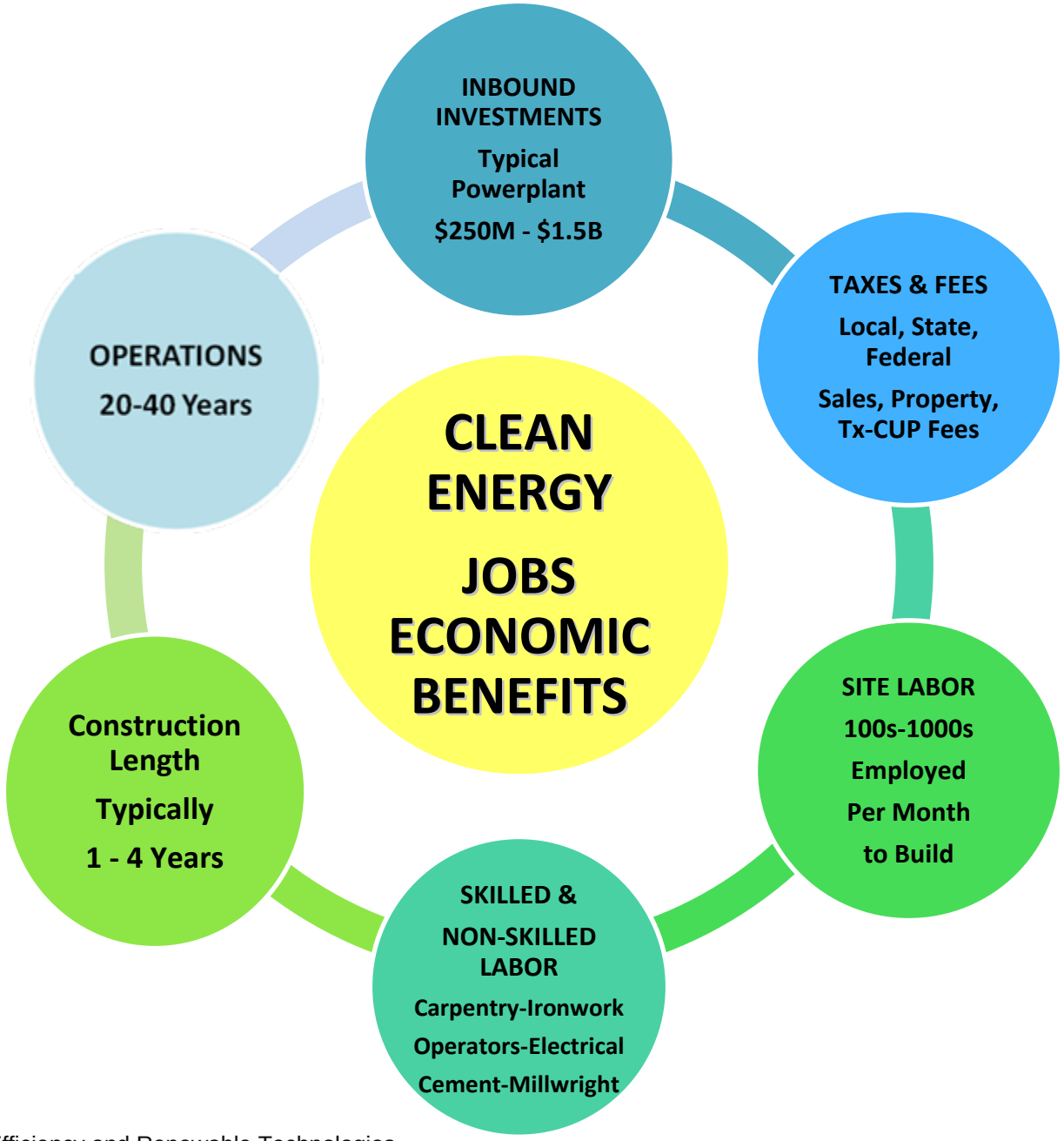
Source: July 2010 Statistics
CA EDD, Labor Market Information Division

COUNTY SNAPSHOTS

July 2009-July 2010

	Construction Job Losses 2009-2010	Utility, Transportation Job Losses 2009-2010	Construction/Utility Jobs Gains From 15 Projects
IMPERIAL	Jobs lost: ↓ **200** 09-10 Change: **-14.3%**	Jobs lost: ↓ **400** 09-10 change: **-3.9%**	360 Jobs 3.5 Years
KERN	Jobs lost: ↓ **1,600** 09-10 change: **-12.6%**	Jobs lost: ↓ **100** 09-10 change: **-0.2%**	1,287 Jobs 2.5 – 4 Years
LOS ANGELES	Jobs lost: ↓ **13,400** 09-10 change: **-11.7%**	Jobs lost: ↓ **7,300** 09-10 change: **-1%**	200 Jobs 0.5 Year
RIVERSIDE SAN BERNARDINO	Jobs lost: ↓ **10,000** 09-10 change: **-14.7%**	Jobs lost: ↓ **3,300** 09-10 change: **-1.2%**	2,528 Jobs 3.5 – 6 Years
SAN LUIS OBISPO	Jobs lost: ↓ **700** 09-10 change: **-13.7%**	Jobs lost: ↓ **500** 09-10 change: **-2.7%**	212 Jobs 3.5 Years

Source: July 2010 Statistics
CA EDD, Labor Market Information Division


INBOUND INVESTMENTS
Typical Powerplant
$250M - $1.5B
TAXES & FEES
Local, State, Federal
Sales, Property, Tx-CUP Fees
SITE LABOR
100s-1000s
Employed
Per Month
to Build
SKILLED & NON-SKILLED LABOR
Carpentry-Ironwork
Operators-Electrical
Cement-Millwright
Construction Length
Typically
1 - 4 Years
OPERATIONS
20-40 Years
CLEAN ENERGY
JOBS
ECONOMIC
BENEFITS

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